9200/2128

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PETITION UNDER 37 C.F.R.§ 1.181(a) REQUESTING WITHDRAWAL OF HOLDING OF ABANDONMENT

APPLICANTS:	Gernt Hoyler	CONFIRMATION NO. 1423
SERIAL NO.:	09/096,113	GROUP ART UNIT: 2123
FILED:	June 11, 1998	EXAMINER: Hugh M. Jones
TITLE:	"COMPUTER-AIDED SIMULATION METHOD FOR DETERMINING THE ELECTROMAGNETIC FIELD OF A BODY"	

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

S I R:

A Notice Of Abandonment was mailed for the above-referenced application on January 22, 2004. The reason stated in the Notice of Abandonment was that the undersigned counsel called on January 16, 2004 and confirmed that the application has been abandoned. This statement is not accurate to the extent that it gives the impression that the undersigned counsel voluntarily telephoned the Examiner to state that the application was abandoned. The undersigned counsel received a voicemail message from the Examiner inquiring about the status of this application, and the undersigned counsel on January 16, 2004 returned the Examiner's call and, to the best of the recollection of the undersigned counsel, informed the Examiner that an RCE had been filed following the Decision by the Board of Patent Appeals and Interferences in order to permit additional prior art to made of record and considered. The Examiner may have interpreted this statement as meaning that the original application had been "abandoned" in the sense that an RCE had been filed, however, this is clearly not a technical "abandonment."

In any event, attached hereto are copies of the RCE filing sheet and the Information Disclosure Statement, with one reference, that were filed on December 16, 2002. A copy of the stamped postcard indicating receipt of these documents at the Patent and Trademark Office on December 16, 2002 also is submitted herewith. As further evidence of the proof of the original filing of these documents, also attached hereto are copies of both sides of check no. 283622, which accompanied the aforementioned RCE filing, to pay for the filing fee. The attached copies of both sides of the check clearly show that it has been processed in the Patent and Trademark Office.

Withdrawal of the holding of abandonment and consideration of the prior art cited in the Information Disclosure Statement are therefore respectfully requested.

Submitted by,

Steven H. Noll (Reg. 28,982)

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on February 6, 2004.

Steven H. Noll

STEVEN H. NOLL

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REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Subsection (b) of 35 U.S.C.§ 132, effective on May29, 2000, provides for continued examination of a utility or plant application filed on or after June 8, 1995. See the American Inventors Protection Act of 1999 (AIPA).

Application Number	09/096,113
Filing Date	June 11, 1998
First Named Inventor	Gernot Hoyler
Group Art Unit	2763
Examiner Name	H. Jones
Attorney Docket Number	P98,0318

This is a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application.
NOTE: *37 C.F.R. § 1.114 is effective on May 29, 2000. If the above-identified application was filed prior to May 29, 2000, applicant may wish to consider filing a continued prosecution application (CPA) under 37 C.F.R. § 1.53 (d) (PTO/SB/29) instead of a RCE to be eligible for the patent term adjustment provisions of the AIPA.* See *Changes to Application Examination and Provisional Application Practice,* Final Rule, 65 *Fed. Reg.* 50092 *(Aug. 16, 2000);* Interim Rule, 65 *Fed. Reg.* 14865 (Mar. 20, 2000), 1233 *Off. Gaz. Pat. Office* 47 (Apr. 11, 2000), which established RCE practice.

1. Submission required under 37 C.F.R. § 1.114

a. ☐ Previously submitted

i. ☐ Consider the amendment(s)/reply under 37 C.F.R. § 1.116 previously filed on _____
(Any unentered amendment(s) referred to above will be entered).

ii. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

iii. ☐ Other _____

b. ☒ Enclosed

i. ☐ Amendment/Reply

ii. ☐ Affidavit(s)/Declaration(s)

iii. ☒ Information Disclosure Statement (IDS)

iv. ☐ Other _____

2. Miscellaneous

a. ☐ Suspension of Action on the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of months. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. § 1.17(i) **required)**

b. ☐ Other _____

3. Fees The RCE under 37 C.F.R. § 1.114 when he RCE is filed.

a. ☐ The director is hereby authorized to charge the following fees, or credit any overpayments, to Deposit Account No. 501519.

i. ☐ RCE fee required under 37 C.F.R. § 1.17(e)

ii. ☐ Extension of time fee (37 C.F. R. §§ 1.136 and 1.17)

iii. ☐ Other _____

b. ☒ Check in the amount of $740.00 enclosed

c. ☐ Payment by credit card (Form PTO 2038 enclosed)

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Name (Print/Type)	STEVEN H. NOLL	Registration No. Attorney/Agent)	29982
Signature	Steven H. Noll	Date	December 10, 2002

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner For Patents, Box RCE, Washington, DC 20231, or facsimile transmitted to the U.S. Patent and Trademark Office on:

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Signature	Steven H. Noll	Date	December 10, 2002

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HON. COMMISSIONER OF PATENTS & TRADEMARKS
WASHINGTON, D.C. 20231

PLEASE APPLY A RECEIPT STAMP HERETO AND MAIL TO ACKNOWLEDGE RECEIPT OF THE ATTACHED:

Gernot Hoyler.
APPLICANT

RCE TRANSMITTAL and IDS W/REFS. & FORM 1449
TYPE OF DOCUMENT(S)

December 10, 2002
$740.00 Filing Fee

USSN 09/096,113 P98,0318 -01
REFERENCE NUMBER

December 13, 2002
27324-0005- SHN

SCHIFF HARDIN & WAITE

\IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE STATEMENT

APPLICANT: Gernot Hoyler CONFIRMATION NO.

SERIAL NO.: 09/096,113 GROUP ART UNIT: 2123

FILED: June 11, 1998

TITLE: "COMPUTER-AIDED SIMULATION METHOD FOR DETERMINING THE ELECTROMAGNETIC FIELD OF A BODY"

Assistant Commissioner for Patents,

Washington, D.C. 20231

S I R:

In accordance with the provisions of 37 C.F.R. § 1.56, Applicant requests that citation and examination of the following document be made during the course of examination of the above-referenced application for United States Letters Patent.

AT "Fast Multipole Method Solution of Three Dimensional Integral Equation," Song et al., IEEE Antennas and Propagation Society, International Symposium, 1995 Digest, pgs 1528-1531

EXPLANATION OF RELEVANCE

Reference AT was cited during prosecution of the European application corresponding to the present United States application, together with an article by Stalzer and an article by Coifman, which have already been made of record in the United States prosecution. A copy of the European Search Report is submitted herewith.

Applicant respectfully submits the Song et al. reference is merely cumulative to the references already of record in the United States prosecution and, more importantly, there is no teaching in the Song et al. reference to perform, for the purpose of determining an electromagnetic of a field of a body, a global expansion

and a local multipole expansion, as set forth in claim 1 of the present application and to superimpose the results of those global and local expansions for a plurality of sub-regions of the body, in order to determine the electromagnetic field of the body, as set forth in the claims of the present application.

Applicant respectfully submits the statements of the Board of Patent Appeals and Interferences in the November 19, 2002 Decision that were made with respect to the references forming the basis of the final rejection from which the Appeal was taken, apply equally to characterize the teachings of the Song et al. reference.

A copy of Reference AT together with Form 1449 is submitted herewith.

All claims of the application are submitted to be in condition for allowance.

Submitted by,

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CERTIFICATE OF MAILING

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Steven H. Noll

STEVEN H. NOLL

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Form PTO-1449

INFORMATION DISCLOSURE CITATION
IN AN APPLICATION
(use several sheets if necessary)

Docket No. P98.0318	Serial No. 09/096,113
Applicant Gernot Hoyler	
Filing Date June 11, 1998	Group Art Unit 2123

U.S. PATENT DOCUMENTS

Examiner's Initials		Document Number	Date	Name	Class	Subclass	Filing Date If appropriate
	AA						
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	Translation Yes	Translation No
	AL							
	AM							
	AN							
	AO							
	AP							
	AQ							
	AR							
	AS							

OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	AT	"Fast Multipole Method Solution of Three Dimensional Integral Equation," Song et al., IEEE Antennas and Propagation Society, International Symposium, 1995 Digest, pgs 1528-1531
	AU	
	AV	
	AW	

Examiner	Date Considered

***EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**

FAST MULTIPOLE METHOD SOLUTION OF THREE DIMENSIONAL INTEGRAL EQUATION †

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1. Introduction

The fast multipole method (FMM) [1-6] speeds up the matrix-vector multiply in the conjugate gradient (CG) method when it is used to solve the matrix equation iteratively. In this paper, FMM is applied to solve the electromagnetic scattering from three dimensional arbitrary shape conducting bodies. The electric field integral equation (EFIE), magnetic field integral equation (MFIE), and combined field integral equation (CFIE) are considered. FMM formula for CFIE has been derived, which reduces the complexity of a matrix-vector multiply from $O(N^2)$ to $O(N^{1.5})$, where N is the number of unknowns. With a nonnested method, using the ray-propagation fast multipole algorithm (RPFMA), the cost of a FMM matrix-vector multiply is reduced to $O(N^{4/3})$. We have implemented a multilevel fast multipole algorithm (MLFMA), whose complexity is further reduced to $O(N\log N)$. The FMM also requires less memory, and hence, can solve a larger problem on a small computer.

2. The Fast Multipole Method (FMM)

Practical electromagnetic problems are often three-dimensional and involve arbitrary geometry. The arbitrary surface is described by dividing it into a number of connected patches which are mathematically described as parametric quadratic surfaces [7]. For conducting objects, the electric field integral equation (EFIE) is given by

$$\hat{t} \cdot \int_S \overline{\mathbf{G}}(\mathbf{r},\mathbf{r}') \cdot \mathbf{J}(\mathbf{r}')dS' = \frac{4\pi i}{k\eta}\hat{t} \cdot \mathbf{E}^i(\mathbf{r}), \tag{1}$$

and magnetic field integral equation (MFIE) for closed conducting objects is given by

$$2\pi\hat{t} \cdot \mathbf{J}(\mathbf{r}) - \hat{t} \cdot \hat{n} \times \nabla \times \int_s dS' g(\mathbf{r},\mathbf{r}')\mathbf{J}(\mathbf{r}') = 4\pi\hat{t} \cdot \hat{n} \times \mathbf{H}^i(\mathbf{r}), \tag{2}$$

where

$$\overline{\mathbf{G}}(\mathbf{r},\mathbf{r}') = (\overline{\mathbf{I}} - \frac{1}{k^2}\nabla\nabla')g(\mathbf{r},\mathbf{r}'), \qquad g(\mathbf{r},\mathbf{r}') = \frac{e^{ik|\mathbf{r}-\mathbf{r}'|}}{|\mathbf{r}-\mathbf{r}'|}. \tag{3}$$

† This work was supported by NASA under grant NASA NAG 2-871, Office of Naval Research under grant N00014-89-J1286, the Army Research Office under contract DAAL03-91-G-0339, and the National Science Foundation under grant NSF ECS 92-24466.

for smaller cube include the contributions from parent cube using shifting and anterpolation, and from the well-separated cube at this level but not well-separated at the parent level. At the finest level, the contributions from non-well-separated cube are calculated directly. Since only nonempty cubes are considered, the complexity for MLFMA is further reduced to $O(N\log N)$.

3. Results and Conclusions

Figure 1 shows the validation of the numerical result from combined field integral equation (CFIE) with FMM against the Mie series solution of the bistatic RCS of a metallic sphere of radius 1m at frequency of 0.72GHz for the parallel polarization. 9408 unknowns with 2-level FMM are used. The solutions of CFIE with FMM agree with Mie series very well.

Figure 2 shows the bistatic RCS of a one meter long metallic square plate at 4.5GHz in the xy plane with incident angle $\theta = 45°$. 32512 unknowns with 6-level FMM are used. The calculation is done by solving EFIE on a SUN-SPARC-2 with 64MB RAM. There is a good agreement between our results and the approximation by physical optics when the RCS is bigger than 0 dB.

In conclusion, the fast multipole method (FMM) has been implemented to speed up the matrix-vector multiply in the CG method when it is used to solve EFIE, MFIE, and CFIE. At all frequencies, CFIE has an unique solution, and converges faster than EFIE and MFIE since the matrix from CFIE has a smaller condition number than those from EFIE and MFIE. FMM approach reduces the complexity of a matrix-vector multiply from $O(N^2)$ to $O(N^{1.5})$. With a multilevel fast multipole algorithm (MLFMA), the complexity is further reduced to $O(N\log N)$. The FMM also requires less memory, and hence, can solve a larger problem on a small computer.

REFERENCES

[1] V. Rokhlin, "Rapid Solution of Integral Equations of Scattering Theory in Two Dimensions," *J. Comput. Phys*, vol. 86, no. 2, pp. 414-439, February 1990.

[2] R. Coifman, V. Rokhlin, and S. Wandzura, "The fast Multipole Method for the Wave Equation: A Pedestrian Prescription," *IEEE Antennas Propagat. Mag.*, vol. 35, no. 3, pp. 7-12, June 1993.

[3] C.C. Lu and W.C. Chew, "A Fast Algorithm for Solving Hybrid Integral Equation," *IEE Proceedings-H*, vol.140, no.6, pp.455-460, December 1993.

[4] R.L. Wagner and W.C. Chew, "A Ray-Propagation Fast Multipole Algorithm," *Micro. Opt. Tech. Lett.*, vol.7, no.10, pp.435-438, July 1994.

[5] B. Dembart and E. Yip, "A 3D Moment Method Code Based on Fast Multipole," *Digest of the 1994 URSI Radio Science Meeting*, p. 23, Seattle, Washington, June 1994.

[6] J.M. Song and W.C. Chew, "Fast Multipole Method Solution Using Parametric Geometry," *Micro. Opt. Tech. Lett.*, vol.7, no. 16, pp.760-765, November 1994.

[7] J.M. Song and W.C. Chew, "Moment Method Solution Using Parametric Geometry," *J. of Electromagnetic Waves and Appl.*, to be published.

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SCHWEIGER & PARTNER
Eing.: 06. Juni 2002
Frist: .....

Eingangspost gescannt

LT 06.12.02 VT 06.11.02
Fristverlängerung beantragt

Datum/Date
06.06.02

Zeichen/Ref./Réf.	Anmeldung Nr./Application No./Demande n°./Patent Nr./Patent No./Brevet n°.
FIN 364 EP ms/m	98102457.3-2201-

Anmelder/Applicant/Demandeur/Patentinhaber/Proprietor/Titulaire
Infineon Technologies AG

MITTEILUNG

Das Europäische Patentamt übermittelt beiliegend den europäischen Recherchenbericht zu der obengenannten europäischen Patentanmeldung.

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☒ Zusammenfassung ☒ Bezeichnung

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Die folgende Abbildung wird mit der Zusammenfassung veröffentlicht: 1

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RÜCKERSTATTUNG DER RECHERCHENGEBÜHR

Falls Artikel 10 der Gebührenordnung in Anwendung kommt, ergeht noch eine gesonderte Mitteilung der Eingangsstelle hinsichtlich der Rückerstattung der Recherchengebühr.

Europäisches Patentamt

EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung
EP 98 10 2457

EINSCHLÄGIGE DOKUMENTE

Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int.Cl.6)
A	COIFMAN R ET AL: "The fast multipole method for electromagnetic scattering calculations" IEEE ANTENNAS AND PROPAGATION SOCIETY INTERNATIONAL SYMPOSIUM. 1993 INTERNATIONAL SYMPOSIUM DIGEST ANTENNAS AND PROPAGATION (CAT. NO.93CH3289-6), PROCEEDINGS OF IEEE ANTENNAS AND PROPAGATION SOCIETY INTERNATIONAL SYMPOSIUM, ANN ARBOR, MI, USA, 28 JUN, Seiten 48-51 vol.1, XP002196962 1993, New York, NY, USA, IEEE, USA ISBN: 0-7803-1246-5 * das ganze Dokument * -----	1-13	

RECHERCHIERTE SACHGEBIETE (Int.Cl.6)

Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt

Recherchenort	Abschlußdatum der Recherche	Prüfer
DEN HAAG	23. Mai 2002	Guingale, A

KATEGORIE DER GENANNTEN DOKUMENTE

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EP 98 10 2457

EINSCHLÄGIGE DOKUMENTE

Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int.Cl.6)
X	SONG J M ET AL: "Fast multipole method solution of three dimensional integral equation" IEEE ANTENNAS AND PROPAGATION SOCIETY INTERNATIONAL SYMPOSIUM. 1995 DIGEST (CAT. NO.95CH35814), IEEE ANTENNAS AND PROPAGATION SOCIETY INTERNATIONAL SYMPOSIUM. 1995 DIGEST, NEWPORT BEACH, CA, USA, 18-23 JUNE 1995, Seiten 1528-1531 vol.3, XP002196960 1995, New York, NY, USA, IEEE, USA ISBN: 0-7803-2719-5	1	G06F17/50
A	* das ganze Dokument *	2,4,5, 7-12	

A	STALZER M A: "Parallelizing the fast multipole method for the Helmholtz equation" PROCEEDINGS OF THE SEVENTH SIAM CONFERENCE ON PARALLEL PROCESSING FOR SCIENTIFIC COMPUTING, PROCEEDINGS OF THE SEVENTH SIAM CONFERENCE ON PARALLEL PROCESSING FOR SCIENTIFIC COMPUTING, SAN FRANCISCO, CA, USA, 15-17 FEB. 1995, Seiten 325-330, XP008002747 1995, Philadelphia, PA, USA, SIAM, USA ISBN: 0-89871-344-7 * Absatz '0002! *	1-13	

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RECHERCHIERTE SACHGEBIETE (Int.Cl.6)
G06F

Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt

Recherchenort	Abschlußdatum der Recherche	Prüfer
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